

ERmet® 2mm Hard Metric Connectors

Mechanical Specifications And Performance

General Connector Specifications

Connector Pitch		2.0 mm
Temperature Range		-55°C to +125°C
Performance level 3 per 61076-4-101		≥ 50 mating cycles
Performance level 2 per IEC 61076-4-101		≥ 250 mating cycles
Performance level 1 per IEC 61076-4-101		≥ 500 mating cycles
Pressfit pin insertion (male or female)	.055 mm hole	36 Newtons (N) typical
	.065 mm hole	25 Newtons (N) typical
Contact Normal Force		0.8 Newtons (N)/contact
Insulation Resistance IEC 512-2 Test 3a	Contact	10 ⁴ MΩ min @ 100 DC
	Shield	10 ⁴ MΩ min @ 100 DC
Mating force per IEC 512-7, Test 13a	Contact	n x 0.75 Newtons (N) maximum (n=number of contacts)
	Ground pin to shield	n x 1 Newtons (N) maximum (n=number of contacts)
Withdrawal force per contact IEC 512-7, Test 13a	Contact	0.15 Newtons (N) minimum
	Ground pin to shield	0.15 Newtons (N) minimum
Contact insertion force (per pin) IEC 352-5 paragraph 3.2.2.2		36.3 Newtons (N) average (male or female)
Flammability		UL 94 V-0
Hole requirements for daughter card and backplane		0.6 mm ± 0.05 mm after plating
Contact Resistance per IEC 512-2. Test 2a		20 mΩ maximum

Male Contact and Housings

Housing Material (8+2) and (5+2)		PBT 30% Glass filled
Temperature Rating Per IEC 512		CTI 275 / CTI 175 M
Contact Material		Phosphor bronze
Contact Plating/Performance Level P1, P2	Contact area	Gold plated
	Compliant area	Sn
	Rear terminal	Sn
Contact Plating/Performance Level R1, R2, R3	Contact area	Gold plated
	Rear terminal	Gold plated

Right Angle Female Contact and Housings

Housing Material (8+2)		LCP 30% glass filled
Housing Material (5+2)		LCP 30% Glass filled
Wafer (8+2) and (5+2)		PBT 30% Glass filled
Temperature Rating Per IEC 512		CTI 275 / CTI 175 M
Contact Material		Phosphor bronze
Contact Plating/Performance Level	Contact area	Gold plated
	Compliant area	Sn
Contact Normal Force		0.8 Newtons (N)/contact

Vertical Females

Wafer (8+2) and (5+2) Material		LCP 30% Glass filled
Temperature Rating Per IEC 512		CTI 275 / CTI 175 M
Contact Material		Phosphor bronze
Contact Plating/Performance Level	Contact area	Gold plated
	Compliant area	Sn
	Extended Terminals	Gold plated



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Ground Return Shields for Right Angle Female Connectors

Base material		Copper alloy
Contact plating per IEC 512 Test 9A	Contact fingers	Gold plated
Performance level 2 per IEC 61076-4-101		≥ 250 mating cycles
Hole requirements for daughter card		0.6 ±0.05 mm after plating

Ground Return Shields for Vertical Female Connectors

Base material		Copper alloy
Contact plating per IEC 512 Test 9A	Contact fingers	Gold plated
Terminal plating per IEC 512 Test 9A	Extended terminal	Gold plated
Performance level 2 per IEC 61076-4-101		≥ 250 mating cycles
Hole requirements for daughter card		0.6 ±0.05 mm after plating

Shrouds

Temperature range	-55°C to +125°C
Housing material	PBT 30% glass filled
Flammability	UL 94 V-O

Coding Keys

Temperature range	-55°C to +125°C
Housing material	Polycarbonate 30% glass filled
Flammability	UL 94 HB
Mechanical strength	≥ 300 Newtons (N)
Weight	0.3 Grams (G) average

ERmet® 2mm Hard Metric Connectors

Mechanical Specifications And Performance

Power Modules: General Connector Specifications

Temperature Range		-55° C to + 125 °C
Press-fit Pin Insertion (Tin/Lead Holes)	0.55 mm hole	~5000 N
	0.65 mm hole	~3500 N
Contact Normal Force		0.20 Nmin
Dielectric Withstanding Voltage	Contact/Contact	1000 V _{eff}
Insulation Resistance (IEC 512-2, Test 3a)		10 ⁴ MΩ min
Mating Force per IEC 512-7, Test 13b		4 N max.
Withdrawal Force per IEC 512-7, Test 13a		4 N max.
Flammability		UL 94 V-0
Hole Requirements		0.70±0.02mm (drilled)
		0.60±0.05mm (plated)
Contact Resistance per IEC 512-2, Test 2a		15 mΩ max.
Current Rating per IEC 60512, Test 5b	20°C	9.0 Amps
	70°C	7.0 Amps
	100°C	4.5 Amps
UL Approval		File Number E84703
CSA Approval		File Number LK067018


ERmet® 2mm Hard Metric Connectors

Mechanical Specifications And Performance

Power Modules: Right Angle Male Contact and Housing

Housing Material		LCP 30% Glass Filled
Temperature Rating		CTI 275
Contact Material		Phosphor Bronze
Contact Plating/Performance Level	Contact Area	Gold plated
	Compliant Area	Sn
	Terminal Area	Sn

Power Modules: Vertical Female Contact and Housing

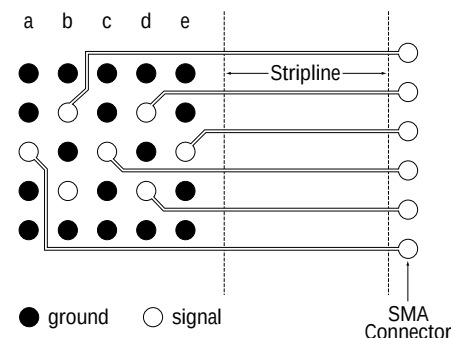
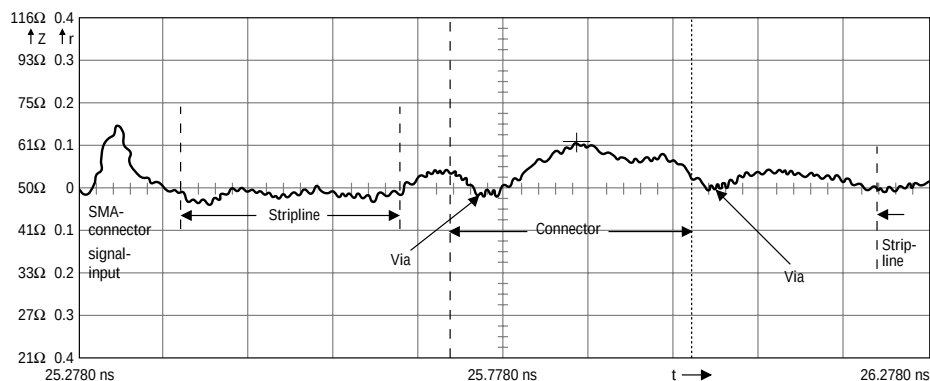
Vertical Female Contact and Housing		
Housing Material		LCP 30% Glass Filled
Temperature Rating		CTI 275
Contact Material		Phosphor Bronze
Contact Plating/Performance Level	Contact Area	Gold plated
	Compliant Area	Sn
	Terminal Area	Sn

ERmet® 2mm Hard Metric Connectors

7-Row Electrical Performance

The ERmet line of 2mm HM connectors set a new, higher standard for 2.0 mm electrical performance. A collection of test reports is available which completely characterizes the connectors' mechanical and high frequency performance. In addition, ERNI can provide a SPICE (Simulator Program for Integrated Circuit Emulation) model to customers, utilizing advanced circuit simulation methods.

In the Time Domain Reflectometry (TDR) plot shown below, note the connector exhibits an almost ideal, 50 ohm characteristic impedance. This smooth, discontinuity-free, impedance progression is due, in part, to both the uniform contact spacing and constant cross section, as well as the uniform dielectric constant. This is a result of the encapsulated terminals of the right angle female connector.



TDR plot showing the impedance progression from a 2mm HM connector. Signal ground pattern as shown.

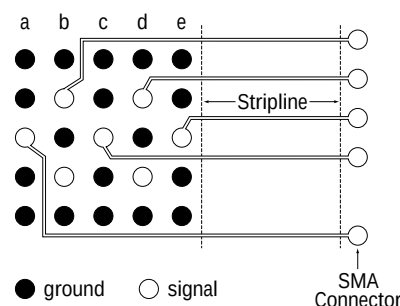
High Frequency Characteristics

The chart below summarizes the electrical characteristics of a test board with similar pin assignments. Note the remarkably low propagation delay (132 ps) and low total skew (a-e = 46 ps).

These factors, combined with the low capacitance and low inductance of the connector, make the ERmet 2mm HM Connector the best choice for demanding, high speed applications.

parameter	connector pin row				
	a	b	c	d	e
capacitance C (f = 100 MHz)	2.5 pF	2.8 pF	2.9 pF	3.1 pF	3.2 pF
inductance L (f = 100 MHz)	6.8 nH	7.6 nH	8.3 nH	8.7 nH	10.5 nH
characteristic impedance	52 Ω	52 Ω	53 Ω	53 Ω	57 Ω
propagation delay*	111 ps (86) ps	119 ps (94) ps	126 ps (101) ps	141 ps (116) ps	157 ps (132) ps
signal skew	8 ps		9 ps	14 ps	15 ps
	maximum 46 ps				
crosstalk (f = 100 MHz)	 57 dB 				
			 53 dB 		
Reflection factor (50 Ω and f = 100 MHz)	0.02	0.02	0.03	0.03	0.065
VSWR (f = 100 MHz)	1.04	1.04	1.06	1.06	1.14
Reflection loss [dB] (f = 100 MHz)	34	34	30.5	30.5	24

* The higher value of the propagation delay is measured from solder-side to solder-side (rear side). The value in parenthesis is calculated from component-side to component-side (front side).



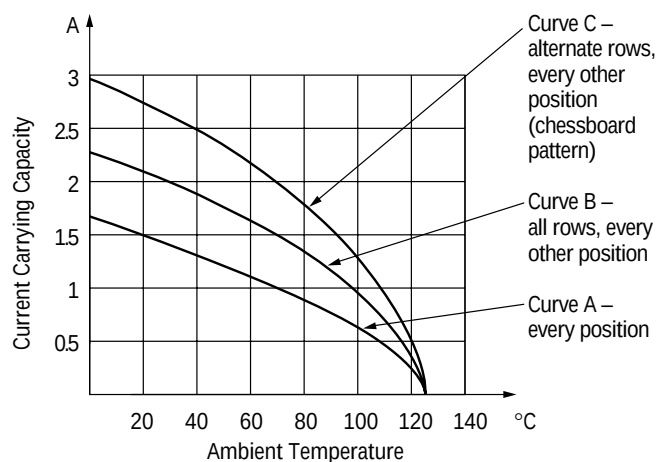
The measurement values are based on this pin configuration.

ERmet® 2mm Hard Metric Connectors

7-Row Electrical Performance

The specifications for contact current rating, dielectric withstanding voltages and creepage and clearance distances are all dependent on the contact loading configuration. For example, if contacts are loaded in a “chessboard pattern,” each contact can carry more current than if every contact is loaded.

Current Rating For Various Contact Mounting Configurations



Dielectric Withstanding Voltage

Contact/Contact:

Row Designation		Fully Loaded	Every Other Position	Chessboard Pattern
Row a + c + e	Within the row	750V _{eff}	1500V _{eff}	–
	Between the rows	1500V _{eff}	1500V _{eff}	–
Row a + b + c	Within the row	750V _{eff}	1500V _{eff}	1500V _{eff}
	Between the rows	750V _{eff}	750V _{eff}	1200V _{eff}
Contact to grounding rows or shielding frame: 750V _{eff}				

Creepage Distances And Clearances Dependent On Contact Layout

Contact/Contact:

Row Designation		Fully Loaded		Every Other Position		Chessboard Pattern	
		Backplane Male Connector	Daughter Card Female Connector	Backplane Male Connector	Daughter Card Female Connector	Backplane Male Connector	Daughter Card Female Connector
Row a + c + e	Within the row	0.8	0.6	2.5	2.5	–	–
	Between the rows	2.5	2.5	2.5	2.5	–	–
Row a + b + c	Within the row	0.8	0.6	2.5	2.5	2.5	2.5
	Between the rows	0.8	0.6	0.8	0.6	1.5	1.2

Creepage and clearance distances for contacts in the outer contact rows (A and E) to shielding rows (optional) is 0.8 mm.

ERmet® 2mm Hard Metric Connectors

10-Row Electrical Performance

The ERmet line of 2mm HM connectors set a new, higher standard for 2.0 mm electrical performance. A collection of test reports is available which completely characterizes the connectors' mechanical and high frequency performance. In addition, ERNI can provide a SPICE (Simulator Program for Integrated Circuit Emulation) model to customers, utilizing advanced circuit simulation methods.

In the Time Domain Reflectometry (TDR) plot shown below, note the connector exhibits an almost ideal, 50 ohm characteristic impedance. This smooth, discontinuity-free, impedance progression is due, in part, to both the uniform contact spacing and constant cross section, as well as the uniform dielectric constant. This is a result of the encapsulated terminals of the right angle female connector.

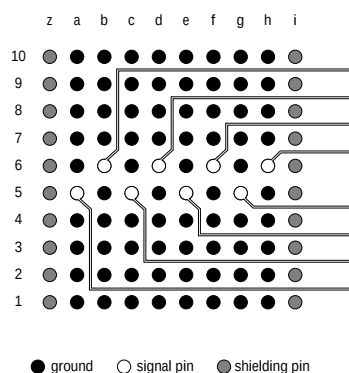
High Frequency Characteristics

The chart below summarizes the electrical characteristics of a test board with similar pin assignments.

Connector the best choice for demanding, high speed applications.

These factors, combined with the low capacitance and low inductance of the connector, make the ERmet 2mm HM

parameter	connection pin row							
	a	b	c	d	e	f	g	h
capacitance C [pF] f = 300 MHz	1.9	2.3	2.5	2.7	2.8	2.8	3.7	4.0
inductance L [nH] f = 100 MHz	5.4	6.3	6.9	7.5	8.1	8.9	11.9	15.5
characteristic impedance $z = \sqrt{L/C}$	53	52	53	53	54	56	57	62
propagation delay [ps]	110	120	130	140	150	160	175	190
signal skew [ps]	10		10		10		15	
			10		10		15	
crosstalk [dB] f=300 MHz	34.9		32.7		30.2		-28.61	
Reflection factor 50 Ohm f = 300 MHz	0.03	0.02	0.02	0.03	0.04	0.06	0.06	0.11
VSWR f = 300 MHz	1.06	1.04	1.04	1.06	1.08	1.13	1.13	1.25
Reflection loss [dB] f = 300 MHz	30.5	34.0	34.0	30.5	28.0	24.4	24.4	19.2



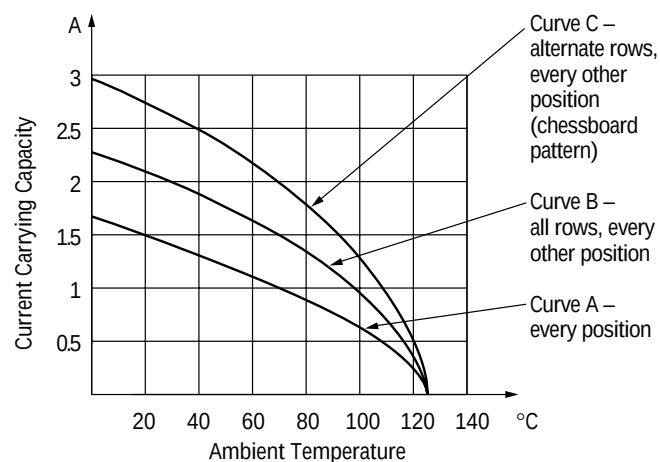
The measurement values are based on this pin configuration.

ERmet® 2mm Hard Metric Connectors

10-Row Electrical Performance

The specifications for contact current rating, dielectric withstanding voltages and creepage and clearance distances are all dependent on the contact loading configuration. For example, if contacts are loaded in a “chessboard pattern,” each contact can carry more current than if every contact is loaded.

Current Rating For Various Contact Mounting Configurations



Dielectric Withstanding Voltage				
Contact/Contact:				
Row Designation		Fully Loaded	Every Other Position	Chessboard Pattern
Row a+c+e+g	Within the row	750V _{eff}	1500V _{eff}	–
Row b+d+f+h	Between the rows	1500V _{eff}	1500V _{eff}	–
Row a+b+c	Within the row	750V _{eff}	1500V _{eff}	1500V _{eff}
Row a+b+c+d				
Row a+b+c+d+e				
Row a+b+c+d+e+f				
Row a+b+c+d+e+f+g	Between the rows	750V _{eff}	750V _{eff}	1200V _{eff}
Row a+b+c+d+e+f+g+h				
Contact to grounding rows or shielding frame: 750V _{eff}				

Creepage Distances And Clearances Dependent On Contact Layout							
Contact/Contact:							
Row Designation		Fully Loaded		Every Other Position		Chessboard Pattern	
		Backplane Male Connector	Daughter Card Female Connector	Backplane Male Connector	Daughter Card Female Connector	Backplane Male Connector	Daughter Card Female Connector
Row a+c+e+g	Within the row	0.8	0.6	2.5	2.5	–	–
Row b+d+f+h	Between the rows	2.5	2.5	2.5	2.5	–	–
Row a+b+c	Within the row	0.8	0.6	2.5	2.5	2.5	2.5
Row a+b+c+d							
Row a+b+c+d+e							
Row a+b+c+d+e+f							
Row a+b+c+d+e+f+g	Between the rows	0.8	0.6	0.8	0.6	1.5	1.2
Row a+b+c+d+e+f+g+h							
Creepage and clearance distances for contacts in the outer contact rows (A and E) to shielding rows (optional) is 0.8 mm.							

ERmet® 2mm Hard Metric Connectors

Approval Certificates, Ordering Information and Spice Models

Approval Certificates

UL Approved by the American approvals authority (Underwriters Laboratories Inc.) File number E 84703.

CSA Tested and found in compliance with the requirements of the Canadian Standards Association (CSA). File numbers LR62504 & LR67018.

ISO 9001 All ERmet connectors are designed and produced in fully approved ERNI ISO 9001 facilities.

Telcordia™ GR 1217 CORE ERmet connectors are available that meet the requirements of Telcordia™ GR-1217-CORE for large systems in uncontrolled environments.

ECTF ERmet connectors are also available to meet the requirements of the Enterprise Computer Telephony Forum's (ECTF) H.110 specification.

IEC 917 And IEC 61076-4-101 The ERmet Connector System meets the requirements of IEC 61076-4-101 which was developed in accordance with the requirements of IEC 917 the standard for for Hard Metric mounting systems.

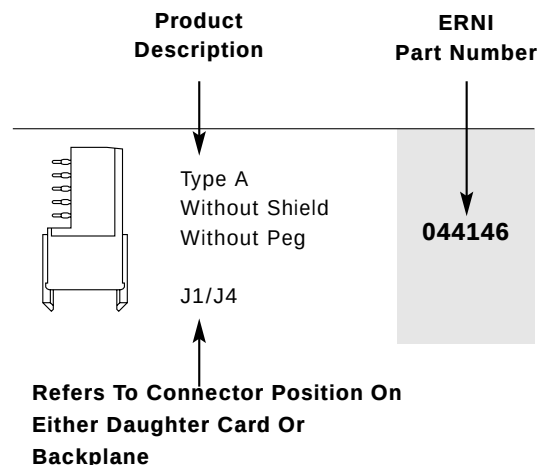
IEEE 1301 And IEEE 1101 And IEEE 1101.10 ERmet connectors were developed to meet the demanding board to backplane physical architecture of IEEE 1301 and have been adapted to meet the requirements of IEEE 1101 and IEEE 1101.10.

PICMG ERmet connectors have been adapted to meet the requirements of the CompactPCI® specification as defined by the PICMG. Special length connectors with the required loading have been molded and assembled for these applications. Type AB connectors have been developed for rear transition card applications.

Ordering Information

All ERNI ERmet 2mm HM Connectors for CompactPCI® and VME64 Extensions are assigned a six digit part number. The following pages contain part numbers, along with product descriptions of many popular ERNI 2mm HM Connectors, complementary components, application, repair and installation tooling. In addition to the configurations listed in this catalog, others are available. Please consult ERNI customer service for more information.

The information right shows the elements of an ERNI part number. Please refer to this page for any clarification.



Spice Models

Software Program for Integrated Circuit Emulation (SPICE) has become an important tool for system architects and circuit designers.

With the increasing complexity and speed of today's system it is no longer practical to design by intuition and simple "rule of thumb" methods. ERNI can provide a designer with a fully validated set of matrix SPICE models of the ERmet®2mm Hard Metric Connector System.

These SPICE models allow the designer to simulate the complete signal path. This allows all trace geometries, device placements and interconnects to be optimized and analyzed before hardware is actually built.

Product Description	ERNI Part Number
5 + 2	104078 ENG
8 + 2	124763 ENG